PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-229048

(43)Date of publication of application : 14.08.2002

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(51)Int.Cl. G02F 1/1343

G02F 1/1335

G02F 1/1337

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(54) LIQUID CRYSTAL DISPLAY AND METHOD OF MANUFACTURING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To decrease the orientation defects of liquid crystal molecules which becomes the cause for light leakage.

SOLUTION: The liquid crystal display device has an array substrate and a counter substrate and liquid crystal layers grasped as the cells of a liquid crystal composition between the array substrate and the counter substrate; the array substrate includes pixel electrodes 25, having reflection conductive layers 25R and transmission conductive layers 25T arranged as windows W for the reflection conductive layers 25R as well alignment layers for covering the reflection conductive layers 25R and the transmission conductive layers 25T. The windows W of the reflection conductive layers 25R are a rectangular shape, having the longitudinal direction approximately aligned to the rubbing direction of

the alignment layers.

LEGAL STATUS [Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] It has the 1st and 2nd electrode substrate and the liquid crystal layer pinched as a cel of a liquid crystal constituent between said 1st and 2nd electrode substrates. The electrode in which said 1st electrode substrate has the light transmission section arranged as an aperture of the light reflex section and said light reflex section, It is the liquid crystal display characterized by being the configuration which has in a list the longitudinal direction to which the aperture of said light reflex section carries out abbreviation coincidence of said light reflex section and the light transmission section in the direction of rubbing of said orientation film including the wrap orientation film.

[Claim 2] It is the liquid crystal display according to claim 1 characterized by for

said light reflex section being constituted by the reflective conductive layer which reflects incident light, and said light transmission section being constituted by at least one transparency conductive layer which penetrates incident light.

[Claim 3] It is the liquid crystal display according to claim 2 characterized by forming each transparency conductive layer on the insulating substrate of light transmission nature, and for said reflective conductive layer exposing each transparency conductive layer, and forming said insulating substrate on a wrap insulator layer.

[Claim 4] It is the liquid crystal display according to claim 1 characterized by for said light reflex section being constituted by the reflective conductive layer which reflects incident light, and said light transmission section being constituted by at least one notch formed in said reflective conductive layer so that incident light may be penetrated.

[Claim 5] Said notch is a liquid crystal display according to claim 4 characterized by being formed in said longitudinal direction by width of face of 10 micrometers or less in a right-angled direction.

[Claim 6] Said 2nd electrode substrate is a liquid crystal display according to claim 1 characterized by determining the counterelectrode which counters said electrode, and this counterelectrode that the direction of rubbing of the orientation film of said 2nd electrode substrate will give predetermined torsion to

the liquid crystal molecular arrangement of said liquid crystal layer including the wrap orientation film based on the direction of rubbing of the orientation film of said 1st electrode substrate.

[Claim 7] Said reflective conductive layer is a liquid crystal display according to claim 2 or 4 characterized by having the concavo-convex pattern over which the reflected light is scattered.

[Claim 8] Said concavo-convex pattern is a liquid crystal display according to claim 7 characterized by being dependent on boom hoisting of the substrate of said reflective conductive layer.

[Claim 9] The process which forms the 1st and 2nd electrode substrate which contains said light reflex section and the light transmission section in an electrode with the light transmission section arranged as an aperture of the light reflex section and said light reflex section, and a list, and contains the wrap orientation film in one side, It has the process which forms the liquid crystal layer pinched as a cel of a liquid crystal constituent between said 1st and 2nd electrode substrates. The manufacture approach of the liquid crystal display which is the configuration in which the aperture of said light reflex section has a longitudinal direction, and is further characterized by having the process which carries out rubbing of said orientation film in the direction which carries out abbreviation coincidence at the longitudinal direction of said aperture.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the liquid crystal display with which a liquid crystal layer uses together especially the transmitted light and the reflected light, and displays an image about the liquid crystal display pinched as a cel of a liquid crystal constituent, and its manufacture approach between the electrode substrates of a pair, and its manufacture approach.

[0002]

[Description of the Prior Art] In recent years, the light weight and the small and high definition liquid crystal display are developed briskly [the visual equipment field centering on the information-machines-and-equipment field, television, etc. centering on a computer]. A common liquid crystal display has the structure

which pinched the liquid crystal layer between the electrode substrates of a pair, and displays an image by carrying out the optical modulation of the light source light in a liquid crystal layer.

[0003] This liquid crystal display is classified into the reflective mold made to reflect the transparency mold which makes the light from the back light arranged in a tooth back or the tooth-back side penetrate, and the light from a perimeter. Both these transparency mold and a reflective mold are influenced by the display image of the ambient light which carries out incidence to a liquid crystal display. The display image in a transparency mold becomes hard to see, when an ambient light is too bright, and the display image in a reflective mold becomes hard to see, when an ambient light is too dark.

[0004] In order to solve such a problem, JP,11-316382,A indicates the method which arranges a light transmission conductive layer with high light transmittance, and a light reflex conductive layer with high reflective effectiveness in each pixel, and uses together the transmitted light and the reflected light. By this method, in a light transmission nature insulating substrate and this insulating substrate, one electrode substrate has a wrap organic compound insulator, and is arranged in opening by which the light transmission conductive layer was formed in a part of organic compound insulator, and a light reflex conductive layer is arranged on an organic compound insulator in the

perimeter of a light transmission conductive layer. These light transmission conductive layer and a light reflex conductive layer are covered with the orientation film.

[0005]

[Problem(s) to be Solved by the Invention] By the way, this orientation film controls the orientation of a liquid crystal molecule by carrying out rubbing processing in the predetermined direction with a rubbing cloth. However, since a rubbing cloth cannot carry out rubbing of the orientation film to homogeneity for the level difference near opening, the optical leakage by poor orientation occurs and it has brought a result to which this reduces contrast.

[0006] The purpose of this invention is to offer the liquid crystal display which can reduce the poor orientation of the liquid crystal molecule leading to optical leakage, and its manufacture approach in view of the above technical problems.

[0007]

[Means for Solving the Problem] According to this invention, it has the 1st and 2nd electrode substrate and the liquid crystal layer pinched as a cel of a liquid crystal constituent between these 1st and 2nd electrode substrates. The electrode in which the 1st electrode substrate has the light transmission section arranged as the light reflex section and an aperture of this light reflex section, and the liquid crystal display which is the configuration which has in a list the

longitudinal direction to which the aperture of the light reflex section carries out abbreviation coincidence of these light reflex section and the light transmission section in the direction of rubbing of the orientation film including the wrap orientation film are offered.

[0008] The process which forms the 1st and 2nd electrode substrate which contains the light reflex section and the light transmission section in the electrode which has the light transmission section further arranged as the light reflex section and an aperture of this light reflex section according to this invention, and a list, and contains the wrap orientation film in one side, It has the process which forms the liquid crystal layer pinched as a cel of a liquid crystal constituent between the 1st and 2nd electrode substrates, and it is the configuration in which the aperture of said light reflex section has a longitudinal direction, and the longitudinal direction of an aperture is further provided with the manufacture approach of the liquid crystal display equipped with the process which carries out rubbing of the orientation film in the direction which carries out abbreviation coincidence.

[0009] In this liquid crystal display and its manufacture approach, the aperture of the light reflex section is a configuration which has the longitudinal direction which carries out abbreviation coincidence in the direction of rubbing of the orientation film, and compensates the level difference produced between this

light reflex section and the light transmission section. In this case, a rubbing cloth can reduce the fields of the orientation film which cannot carry out rubbing enough under the effect of a level difference rather than the case where the longitudinal direction of an aperture is greatly shifted [of the orientation film] from rubbing. Therefore, the poor orientation leading to optical leakage can be reduced, and high contrast can be acquired.

[0010]

[Embodiment of the Invention] Hereafter, the liquid crystal display concerning the 1st operation gestalt of this invention is explained with reference to an accompanying drawing. This liquid crystal display is a method which uses together the transmitted light and the reflected light, and displays an image.

[0011] Drawing 1 shows the partial cross-section structure of a liquid crystal display, and drawing 2 shows the planar structure near [which is shown in drawing 1] a pixel. This liquid crystal display is equipped with the liquid crystal layer LQ pinched between the array substrate AR, the opposite substrate CT, and these substrates AR and CT as shown in drawing 1 .

[0012] Two or more scanning lines 14 with which the array substrate AR is arranged along with the line of the insulating substrate 21 of light transmission nature, two or more pixel electrodes 25 arranged in the shape of a matrix on this insulating substrate 21, two or more signal lines 13 arranged in accordance with

the train of these pixel electrode 25, and these pixel electrode 25, Wrap orientation film 27A is included for the drive circuit which drives two or more thin film transistor (TFT) 23, two or more scanning lines 14, and two or more signal lines 13 which are respectively arranged as a switching element for pixels near the crossover location of the correspondence scanning line 14 and the correspondence signal line 13, and two or more pixel electrodes 25. The opposite substrate CT has [the insulating substrate 22 of light transmission nature, the red who counters the pixel electrode 25 of a correspondence train respectively, and ranks with a line writing direction in order, green and the color filter 24 formed on an insulating substrate 22 as a blue stripe, and a color filter 24] wrap orientation film 27B for the wrap transparence counterelectrode 29 and this counterelectrode 29. Moreover, the phase contrast plate RT 1 and a polarizing plate PL 1 are stuck on an insulating substrate 21 in the opposite side in two or more pixel electrodes 25, and the phase contrast plate RT 2 and a polarizing plate PL 2 are stuck on an insulating substrate 22 in the opposite side in a color filter 24.

[0013] In this liquid crystal display, the liquid crystal layer LQ is divided to two or more pixel fields PX respectively corresponding to two or more pixel electrodes 25, and each pixel field PX is respectively arranged between the two contiguity scanning lines 14 and two contiguity signal lines 13. Each thin film transistor 23

answers the scan pulse supplied from the correspondence scanning line 14, and supplies the potential of the correspondence signal line 13 to the correspondence pixel electrode 25. Each pixel electrode 25 is impressed to the correspondence pixel field PX of the liquid crystal layer LQ by making potential of the correspondence signal line 13 into pixel potential, and controls the permeability of the pixel field PX based on the potential difference of this pixel potential and the potential of a counterelectrode 29. Moreover, each pixel electrode 25 has transparency conductive layer 25T, such as ITO arranged as an aperture W of reflective conductive layer 25R and this reflective conductive layer 25R of a metal like silver, aluminum, or these alloys. Reflective conductive layer 25R constitutes the light reflex section over which it reflects in and the light which carries out incidence through the liquid crystal layer LQ is scattered with a high reflection factor from an opposite substrate CT side, and transparency conductive layer 25T constitute the light transmission section which penetrates the light which carries out incidence from the tooth back of the array substrate AR to the liquid crystal layer LQ side. The aperture W of reflective conductive layer 25R is a rectangle which has the longitudinal direction which carries out abbreviation coincidence in the direction of rubbing of orientation film 27A.

[0014] In the array substrate AR, wiring of two or more thin film transistors 23, and two or more reflective conductive layer 25T and others is formed on the light

transmission nature insulating substrate 21, and is covered with an insulating substrate 21 by the organic compound insulator 31. This organic compound insulator 31 has the concavo-convex pattern arranged corresponding to two or more pixel fields PX so that two or more opening 31H which expose correspondence transparency conductive layer 25T partially respectively, and these opening 31H may be surrounded, respectively. Each thin film transistor 23 has the gate connected to the correspondence scanning line 14, the source connected to transparency conductive layer 25T of the correspondence pixel electrode 25, and the drain connected to the correspondence signal line 13. Reflective conductive layer 25R of each pixel electrode 25 contacts the rim of correspondence transparency conductive layer 25T, and is formed on an organic compound insulator 31. This reflective conductive layer 25R is formed by predetermined thickness along with the concavo-convex pattern of an organic compound insulator 31, and contains crevice 25RB which surrounds two or more hemispherical heights 25RA arranged at random and these hemispherical heights 25RA, and is arranged as a concavo-convex pattern. This reflective conductive layer 25R is reflected so that incident light may be scattered with this concavo-convex pattern.

[0015] Next, the production process of the liquid crystal display mentioned above is explained.

[0016] In manufacture of the array substrate AR, two or more thin film transistors 23, two or more transparency conductive layer 25T, and other wiring repeat the usual membrane formation and patterning, and are formed on the light transmission nature insulating substrates 21, such as a high strain point glass plate and a quartz plate. Then, the insulating-substrate 21 whole is applied to the resin of positive type photosensitivity by a spin coat method etc. as an organic compound insulator 31 with a wrap thickness of 1 micrometer - about 4 micrometers, for example. After prebaking of an insulating substrate 21, an organic compound insulator 31 is partially exposed in the range corresponding to two or more opening 31H using the photo mask for openings, and is exposed using the photo mask for concavo-convex patterns with two or more circular protection-from-light sections arranged in the random pitch in the range of each pixel field PX so that it may not lap with a signal line 13 and the scanning line 14 further. Here, the light exposure for concavo-convex patterns is set as 10-200mJ, the light exposure for openings is set as 200-2000mJ, and the diameter of the circular protection-from-light section is set as about 2-20 micrometers. The boom-hoisting configuration and consistency of a concavo-convex pattern are controlled by the opening configuration of a photo mask, the consistency, light exposure, etc.

[0017] Then, in order that an organic compound insulator 31 may remove an

above-mentioned exposure part, negatives are developed, and this forms the concavo-convex pattern of an organic compound insulator 31 with two or more opening 31H. In this phase, since a concavo-convex pattern serves as acute-angle-like boom hoisting, it is carried out so that heat treatment of an insulating substrate 21 may change this concavo-convex pattern into the smooth condition that the angle was able to be taken.

[0018] Then, metal membranes, such as aluminum, nickel, Cr, and Ag, accumulate on an organic compound insulator 31 by the thickness of about 100nm by the spatter, and patterning is carried out to a configuration predetermined by the photo etching method, and they form two or more reflective conductive layer 25R which contacted the rim of correspondence transparency conductive layer 25T respectively by this.

[0019] Then, it is formed in a predetermined field in order to secure the predetermined gap where two or more pillar-shaped spacers 15 serve as thickness of the liquid crystal layer LQ. Orientation film 27A applies about 3 micrometers of polyimide of a low-temperature cure mold so that the pixel electrode 25 and an organic compound insulator 31 may be covered by printing, and it is the longitudinal direction () of the aperture W of reflective conductive layer 25R about this. Namely, it is formed in the direction of rubbing which is in agreement in the direction in which the level difference of reflective conductive

layer 25R and transparency conductive layer 25T is extended for a long time by carrying out rubbing processing with a rubbing cloth.

[0020] On the other hand, in manufacture of the opposite substrate CT, the color filter 24 which distributed the pigment etc. is formed on the light transmission nature insulating substrates 22, such as a high strain point glass plate and a quartz plate. The transparence counterelectrode 29 is formed by depositing 1TO on the coloring layer 24 in a spatter. Then, it is formed when orientation film 27B applies about 3 micrometers of polyimide of a low-temperature cure mold so that the transparence counterelectrode 29 may be covered by printing, and it carries out rubbing processing of this with a rubbing cloth. In addition, rubbing processing of orientation film 27B doubles an oriented axis to orientation film 27A so that the liquid crystal molecule of the liquid crystal layer LQ may be considered as an abbreviation homogeneous array. The array substrate AR and the opposite substrate CT are unified after formation of the orientation film 27A and 27B. The array substrate AR and the opposite substrate CT carry out the orientation film 27A and 27B inside, go, and, specifically, are stuck through the periphery sealant which is the adhesives of epoxy system heat-curing resin. The liquid crystal layer LQ uses as a cel liquid crystal impregnation space surrounded by the periphery sealant between the array substrate AR and the opposite substrate CT, and is obtained by injecting a liquid crystal constituent

like a nematic liquid crystal into this cel, and closing with ultraviolet-rays hardening resin. In this way, where the liquid crystal layer LQ is pinched between the array substrate AR and the opposite substrate CT, the phase contrast plate RT 1 and a polarizing plate PL 1 are stuck on an insulating substrate 21 in the opposite side in two or more pixel electrodes 25, and the phase contrast plate RT 2 and a polarizing plate PL 2 are stuck on an insulating substrate 22 in the opposite side in a color filter 24. A liquid crystal display is completed as mentioned above.

[0021] According to the liquid crystal display of the 1st operation gestalt mentioned above, the aperture W of reflective conductive layer 25R is a rectangle which has the longitudinal direction which carries out abbreviation coincidence in the direction of rubbing of orientation film 27A so that the level difference produced with the thickness of an organic compound insulator 31 between reflective conductive layer 25R and transparency conductive layer 25T as shown in drawing 1 may be compensated. If the longitudinal direction of Aperture W and the direction of rubbing of orientation film 27A are expressed for example, with a clock format for 12 hours, when the longitudinal direction of Aperture W is set up in the direction of 6:00 to 12:00 [parallel to a signal line 13], the direction of rubbing of orientation film 27A is also set up in the direction of 6:00 to 12:00. When such a liquid crystal display was actually driven, generating

along the demerits side of Aperture W, as the poor orientation field of 4 micrometers of **** shows (a) of drawing 3 was checked by microscope observation. However, in visual observation, both the transmitted light display image and the reflected light display image were highly defined. In the transmitted light display, the contrast 350 was able to be acquired especially.

[0022] As the example of the 1st comparison, the same liquid crystal display as the 1st operation gestalt was manufactured except for changing the direction of rubbing of orientation film 27A in the direction of 7:30-1:30, and the direction of 9:00 to 3:00, and the experiment which actually drives this was conducted. Then, when the direction of rubbing was the direction of 7:30-1:30, generating along both the merits side of Aperture W and the demerits side, as a poor orientation field shows (b) of drawing 3 was checked by microscope observation. That result was 280 when contrast was measured at this time. On the other hand, when the direction of rubbing was the direction of 9:00 to 3:00, generating along the merits side of Aperture W, as a poor orientation field shows (c) of drawing 3 was checked by microscope observation. That result was 260 when contrast was measured at this time. That is, if the direction of rubbing of orientation film 27A shifts from the longitudinal direction of Aperture W greatly, the die length of the poor orientation field where rubbing of the rubbing cloth is not enough carried out under the effect of a level difference will be increased. Therefore, high contrast

which exceeds 300 by the optical leakage corresponding to this poor orientation field cannot be acquired.

[0023] Except for changing into the perpendicular orientation film which does not carry out rubbing processing of the orientation film 27B by the side of the opposite substrate CT as the example of the 2nd comparison, and having acquired the hybrid mold liquid crystal array, the same liquid crystal display as the 1st operation gestalt was manufactured, and the experiment which actually drives this was conducted. Then, when the direction of rubbing of orientation film 27A was also set up in the direction of 6:00 to 12:00, it became the same inclination as an above-mentioned result for the highest contrast to be acquired. In addition, although considered as the hybrid mold liquid crystal array in this example of a comparison, it is good also as a TN liquid crystal array.

[0024] Next, the liquid crystal display concerning the 2nd operation gestalt of this invention is explained. Drawing 4 shows the partial cross-section structure of this liquid crystal display, and drawing 5 shows the planar structure near [which is shown in drawing 4] a pixel. This liquid crystal display is constituted like the 1st operation gestalt except for the following things. For this reason, in drawing 4 and drawing 5 , the same reference mark shows the same part as the 1st operation gestalt, and that explanation is omitted.

[0025] This liquid crystal display does not have transparency electric conduction

film 25T as shown in drawing 1 . Instead, the light transmission section is constituted by three notch 25TCs formed in reflective conductive layer 25R as an aperture W of the light reflex section. The liquid crystal of the field corresponding to this notch 25TC is driven using the leakage electric field produced with the edge of reflective conductive layer 25R. for this reason, the organic compound insulator 31 -- each -- opening 31H are not for exposing transparency electric conduction film 25T, and are formed as a contact hole for connecting correspondence reflective conductive layer 25R to the source of the correspondence thin film transistor 23. Each notch 25TC is the rectangle of a dimension called width-of-face [of 4 micrometers] x die length of 50 micrometers. The longitudinal direction of this rectangle carries out abbreviation coincidence in the direction of rubbing of orientation film 27A, as shown in drawing 5 . Next, the production process of a different array substrate AR from the 1st operation gestalt is explained. In manufacture of the array substrate AR, two or more thin film transistors 23 and other wiring repeat the usual membrane formation and patterning, and are formed on the light transmission nature insulating substrates 21, such as a high strain point glass plate and a quartz plate. Then, the insulating-substrate 21 whole is applied to the resin of positive type photosensitivity by a spin coat method etc. as an organic compound insulator 31 with a wrap thickness of 1 micrometer - about 4 micrometers, for

example. After prebaking of an insulating substrate 21, an organic compound insulator 31 is partially exposed in the range corresponding to two or more opening 31H using the photo mask for openings, and is exposed using the photo mask for concavo-convex patterns with two or more circular protection-from-light sections arranged in the random pitch in the range of each pixel field PX so that it may not lap with a signal line 13 and the scanning line 14 further. Here, like the 1st operation gestalt, the light exposure for concavo-convex patterns is set as 10-200mJ, the light exposure for openings is set as 200-2000mJ, and the diameter of the circular protection-from-light section is set as about 2-20 micrometers. The boom-hoisting configuration and consistency of a concavo-convex pattern are controlled by the opening configuration of a photo mask, the consistency, light exposure, etc.

[0026] Then, in order that an organic compound insulator 31 may remove an above-mentioned exposure part, negatives are developed, and the concavo-convex pattern of an organic compound insulator 31 is formed with two or more opening 31H which expose the source of the correspondence thin film transistor 23 respectively by this. In this phase, since a concavo-convex pattern serves as acute-angle-like boom hoisting, it is carried out so that heat treatment of an insulating substrate 21 may change this concavo-convex pattern into the smooth condition that the angle was able to be taken.

[0027] Then, while metal membranes, such as aluminum, nickel, Cr, and Ag, accumulate on an organic compound insulator 31 by the thickness of about 100nm by the spatter, and patterning is carried out to the predetermined configuration shown in drawing 5 about each pixel field PX by the photo etching method and they contact the source of the correspondence thin film transistor 23 respectively by this, two or more reflective conductive layer 25R with three notch 25TCs is formed.

[0028] Then, it is formed in a predetermined field in order to secure the predetermined gap where two or more pillar-shaped spacers 15 serve as thickness of the liquid crystal layer LQ. Orientation film 27A applies about 3 micrometers of polyimide of a low-temperature cure mold so that the pixel electrode 25 and an organic compound insulator 31 may be covered by printing. It is formed by carrying out rubbing processing of this with a rubbing cloth in the direction of rubbing which is in agreement with the longitudinal direction (namely, direction where the level difference of the light reflex section and the light transmission section is extended for a long time) of the aperture W of reflective conductive layer 25R as shown in drawing 5 .

[0029] Then, the unification process of the array substrate AR and the opposite substrate CT is performed in the production process of the opposite substrate CT, and a list like the 1st operation gestalt.

[0030] According to the liquid crystal display of the 2nd operation gestalt mentioned above, it is the rectangle which has the longitudinal direction which carries out abbreviation coincidence in the direction of rubbing of orientation film 27A so that the level difference which notch 25TC of reflective conductive layer 25R was formed as an aperture W of the light reflex section, and this aperture W produced with the thickness of reflective conductive layer 25R between the light reflex section and the light transmission section may be compensated. Namely, when the longitudinal direction of Aperture W is set up in the direction of 7:30-1:30, the direction of rubbing of orientation film 27A is also set up in the direction of 7:30-1:30. In this case, a rubbing cloth can reduce the fields of orientation film 27A which cannot carry out rubbing enough under the effect of a level difference rather than the case where the longitudinal direction of Aperture W is greatly shifted [of orientation film 27A] from rubbing. Therefore, the poor orientation leading to optical leakage can be reduced, and high contrast can be acquired. When such a liquid crystal display was actually driven, the high-definition display image was checked by visual observation. Moreover, the contrast 20 was able to be acquired by the transmitted light display. When two or more notch 25TCs are especially formed by width of face of 10 micrometers or less, it is possible to improve sharply the contrast which falls by the optical leakage by poor orientation.

[0031] As the example of the 3rd comparison, the same liquid crystal display as the 2nd operation gestalt was manufactured except for changing the direction of rubbing of orientation film 27A in the direction of 6:00 to 12:00, and the direction of 9:00 to 3:00, and the experiment which actually drives this was conducted. Then, when the direction of rubbing is the direction of 6:00 to 12:00, contrast is set to 8 by transmitted light display. On the other hand, when the direction of rubbing is the direction of 9:00 to 3:00, contrast is set to 6 by transmitted light display. Therefore, contrast of a transmitted light display which exceeds 20 obtained with the 2nd operation gestalt by the optical leakage corresponding to this poor orientation field cannot be acquired.

[0032] In addition, this invention is variously deformable in the range which is not limited to an above-mentioned operation gestalt and does not deviate from the summary. For example, notch 25TCs of the 2nd operation gestalt may be other configurations which have a longitudinal direction like for example, the ellipse form instead of a rectangle. Furthermore, the number of notch 25TCs may be changed into numbers other than three piece.

[0033]

[Effect of the Invention] According to this invention, the liquid crystal display which can reduce the poor orientation of the liquid crystal molecule leading to optical leakage, and its manufacture approach can be offered as mentioned

above.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the partial cross-section structure of the liquid crystal display concerning the 1st operation gestalt of this invention.

[Drawing 2] It is drawing showing the planar structure near [which is shown in drawing 1] a pixel.

[Drawing 3] It is drawing for explaining the reason which makes in agreement the longitudinal direction of the aperture shown in drawing 1 in the direction of rubbing of the orientation film.

[Drawing 4] It is drawing showing the partial cross-section structure of the liquid

crystal display concerning the 2nd operation gestalt of this invention.

[Drawing 5] It is drawing showing the planar structure near [which is shown in drawing 4] a pixel.

[Description of Notations]

25 -- Pixel electrode

25T -- Transparency conductive layer

25R -- Reflective conductive layer

25TCs -- Notch

27A -- Orientation film

AR -- Array substrate

CT -- Opposite substrate

LQ -- Liquid crystal layer

PX -- Pixel field

W -- Aperture

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－229048
（P2002－229048A）
(43)公開日　平成14年８月14日(2002.8.14)

(51)Int.Cl.⁷		識別記号	FI			テーマコード（参考）
Ｇ０２Ｆ	1/1343		Ｇ０２Ｆ	1/1343		２Ｈ０９０
	1/1335	５２０		1/1335	５２０	２Ｈ０９１
	1/1337			1/1337		２Ｈ０９２
		５００			５００	

審査請求　未請求　請求項の数９　ＯＬ　（全　６　頁）

(21)出願番号　特願2001－21997(P2001－21997)
(22)出願日　平成13年１月30日(2001.1.30)

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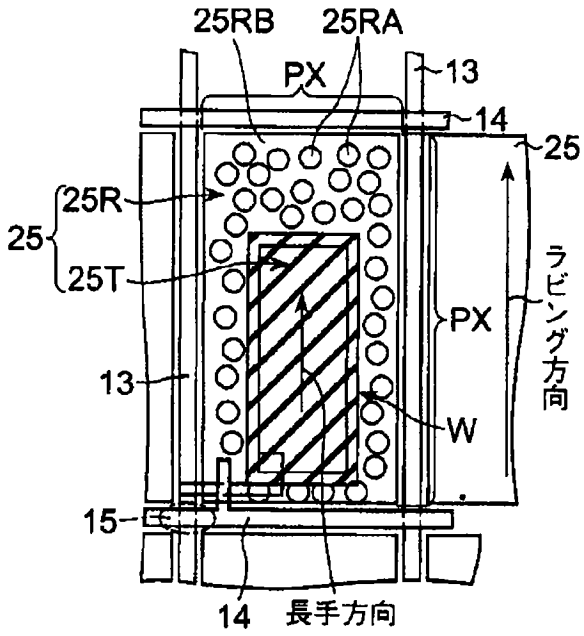
最終頁に続く

(54)【発明の名称】　液晶表示装置およびその製造方法

(57)【要約】
【課題】光漏れの原因となる液晶分子の配向不良を低減する。
【解決手段】液晶表示装置はアレイ基板および対向基板と、これらアレイ基板および対向基板間に液晶組成物のセルとして挟持される液晶層とを備え、アレイ基板は反射導電層２５Ｒおよび反射導電層２５Ｒの窓Ｗとして配置される透過導電層２５Ｔを持つ画素電極２５、並びに反射導電層２５Ｒおよび透過導電層２５Ｔを覆う配向膜を含む。反射導電層２５Ｒの窓Ｗは配向膜のラビング方向に略一致する長手方向を持つ長方形である。



【特許請求の範囲】
【請求項１】　第１および第２電極基板と、前記第１および第２電極基板間に液晶組成物のセルとして挟持される液晶層とを備え、前記第１電極基板は光反射部および前記光反射部の窓として配置される光透過部を持つ電極、並びに前記光反射部および光透過部を覆う配向膜を含み、前記光反射部の窓は前記配向膜のラビング方向に略一致する長手方向を持つ形状であることを特徴とする液晶表示装置。
【請求項２】　前記光反射部は入射光を反射する反射導電層により構成され、前記光透過部は入射光を透過する少なくとも１個の透過導電層により構成されることを特徴とする請求項１に記載の液晶表示装置。
【請求項３】　各透過導電層は光透過性の絶縁基板上に形成され、前記反射導電層は各透過導電層を露出させて前記絶縁基板を覆う絶縁膜上に形成されることを特徴とする請求項２に記載の液晶表示装置。
【請求項４】　前記光反射部は入射光を反射する反射導電層により構成され、前記光透過部は入射光を透過するように前記反射導電層に形成される少なくとも１個の切欠部により構成されることを特徴とする請求項１に記載の液晶表示装置。
【請求項５】　前記切欠部は前記長手方向に直角な方向において幅１０μｍ以下で形成されることを特徴とする請求項４に記載の液晶表示装置。
【請求項６】　前記第２電極基板は前記電極に対向する対向電極およびこの対向電極を覆う配向膜を含み、前記第２電極基板の配向膜のラビング方向は前記液晶層の液晶分子配列に所定の捻れを持たせるように前記第１電極基板の配向膜のラビング方向に基づいて決定されることを特徴とする請求項１に記載の液晶表示装置。
【請求項７】　前記反射導電層は反射光を散乱させる凹凸パターンを持つことを特徴とする請求項２または４に記載の液晶表示装置。
【請求項８】　前記凹凸パターンは前記反射導電層の下地の起伏に依存することを特徴とする請求項７に記載の液晶表示装置。
【請求項９】　光反射部および前記光反射部の窓として配置される光透過部を持つ電極、並びに前記光反射部および光透過部を覆う配向膜を一方に含む第１および第２電極基板を形成する工程と、前記第１および第２電極基板間に液晶組成物のセルとして挟持される液晶層を形成する工程とを備え、前記光反射部の窓が長手方向を持つ形状であり、さらに前記窓の長手方向に略一致する方向に前記配向膜をラビングする工程を備えることを特徴とする液晶表示装置の製造方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は液晶層が一対の電極基板間に液晶組成物のセルとして挟持される液晶表示装置およびその製造方法に関し、特に透過光および反射光を併用して画像を表示する液晶表示装置およびその製造方法に関する。
【０００２】
【従来の技術】近年では、軽量、小型、高精細な液晶表示装置がコンピュータを中心とする情報機器分野およびテレビなどを中心とする映像機器分野で盛んに開発されている。一般的な液晶表示装置は一対の電極基板間に液晶層を挟持した構造を有し、光源光を液晶層で光学変調することにより画像を表示する。
【０００３】この液晶表示装置は、例えば背面または背面側方に配置されるバックライトからの光を透過させる透過型および周囲からの光を反射させる反射型に分類される。これら透過型および反射型のいずれも、表示画像が液晶表示装置に入射する周囲光の影響を受ける。透過型での表示画像は周囲光が明るすぎる場合に見にくくなり、反射型での表示画像は周囲光が暗すぎる場合に見にくくなる。
【０００４】このような問題を解決するため、例えば特開平１１－３１６３８２は光透過率の高い光透過導電層と反射効率の高い光反射導電層とを各画素内に配置して透過光および反射光を併用する方式を開示する。この方式では、一方の電極基板が光透過性絶縁基板およびこの絶縁基板を覆う有機絶縁膜を有し、光透過導電層が有機絶縁膜の一部に形成された開口内に配置され、光反射導電層が光透過導電層の周囲において有機絶縁膜上に配置される。これら光透過導電層および光反射導電層は配向膜により覆われる。
【０００５】
【発明が解決しようとする課題】ところで、この配向膜はラビング布で所定方向にラビング処理されることにより液晶分子の配向を制御する。しかし、ラビング布は開口付近の段差のために均一に配向膜をラビングできないため、配向不良による光漏れが発生し、これがコントラストを低下させる結果となっている。
【０００６】本発明の目的は、上述のような課題に鑑み、光漏れの原因となる液晶分子の配向不良を低減できる液晶表示装置およびその製造方法を提供することにある。
【０００７】
【課題を解決するための手段】本発明によれば、第１および第２電極基板と、これら第１および第２電極基板間に液晶組成物のセルとして挟持される液晶層とを備え、第１電極基板は光反射部およびこの光反射部の窓として配置される光透過部を持つ電極、並びにこれら光反射部および光透過部を覆う配向膜を含み、光反射部の窓は配向膜のラビング方向に略一致する長手方向を持つ形状である液晶表示装置が提供される。
【０００８】本発明によれば、さらに光反射部およびこの光反射部の窓として配置される光透過部を持つ電極、

並びに光反射部および光透過部を覆う配向膜を一方に含む第１および第２電極基板を形成する工程と、第１および第２電極基板間に液晶組成物のセルとして挟持される液晶層を形成する工程とを備え、前記光反射部の窓が長手方向を持つ形状であり、さらに窓の長手方向に略一致する方向に配向膜をラビングする工程を備える液晶表示装置の製造方法が提供される。

【０００９】この液晶表示装置およびその製造方法において、光反射部の窓は配向膜のラビング方向に略一致する長手方向を持つ形状であり、この光反射部および光透過部間に生じた段差を補償する。この場合、窓の長手方向が配向膜のラビング方向から大きくずれている場合よりもラビング布が段差の影響で十分ラビングできない配向膜の領域を削減できる。従って、光漏れの原因となる配向不良を低減して、高いコントラストを得ることができる。

【００１０】

【発明の実施の形態】以下、本発明の第１実施形態に係る液晶表示装置について添付図面を参照して説明する。この液晶表示装置は透過光および反射光を併用して画像を表示する方式である。

【００１１】図１は液晶表示装置の部分的な断面構造を示し、図２は図１に示す画素付近の平面構造を示す。この液晶表示装置は図１に示すようにアレイ基板ＡＲ、対向基板ＣＴ、これら基板ＡＲおよびＣＴ間に挟持される液晶層ＬＱを備える。

【００１２】アレイ基板ＡＲは光透過性の絶縁基板２１、この絶縁基板２１上でマトリクス状に配置される複数の画素電極２５、これら画素電極２５の列に沿って配置される複数の信号線１３、これら画素電極２５の行に沿って配置される複数の走査線１４、各々対応走査線１４および対応信号線１３の交差位置近傍に画素用スイッチング素子として配置される複数の薄膜トランジスタ（ＴＦＴ）２３、複数の走査線１４および複数の信号線１３を駆動する駆動回路、および複数の画素電極２５を覆う配向膜２７Ａを含む。対向基板ＣＴは光透過性の絶縁基板２２と、各々対応列の画素電極２５に対向して行方向に順番に並ぶ赤、緑、および青のストライプとして絶縁基板２２上に形成されるカラーフィルタ２４と、カラーフィルタ２４を覆う透明対向電極２９と、この対向電極２９を覆う配向膜２７Ｂとを有する。また、位相差板ＲＴ１および偏光板ＰＬ１が複数の画素電極２５とは反対側において絶縁基板２１に貼り付けられ、位相差板ＲＴ２および偏光板ＰＬ２がカラーフィルタ２４とは反対側において絶縁基板２２に貼り付けられる。

【００１３】この液晶表示装置では、液晶層ＬＱが複数の画素電極２５にそれぞれ対応して複数の画素領域ＰＸに区画され、各画素領域ＰＸが各々２本の隣接走査線１４と２本の隣接信号線１３との間に配置される。各薄膜トランジスタ２３は対応走査線１４から供給される走査パルスに応答して対応信号線１３の電位を対応画素電極２５に供給する。各画素電極２５は対応信号線１３の電位を画素電位として液晶層ＬＱの対応画素領域ＰＸに印加し、この画素電位と対向電極２９の電位との電位差に基づいて画素領域ＰＸの透過率を制御する。また、各画素電極２５は例えば銀、アルミニウム、あるいはこれらの合金のような金属の反射導電層２５Ｒおよびこの反射導電層２５Ｒの窓Ｗとして配置されるＩＴＯ等の透過導電層２５Ｔを有する。反射導電層２５Ｒは対向基板ＣＴ側から液晶層ＬＱを介して入射する光を高い反射率で反射し散乱させる光反射部を構成し、透過導電層２５Ｔはアレイ基板ＡＲの背面から入射する光を液晶層ＬＱ側に透過する光透過部を構成する。反射導電層２５Ｒの窓Ｗは配向膜２７Ａのラビング方向に略一致する長手方向を持つ長方形である。

【００１４】アレイ基板ＡＲでは、複数の薄膜トランジスタ２３、複数の反射導電層２５Ｔその他の配線が光透過性絶縁基板２１上に形成され、有機絶縁膜３１で絶縁基板２１と共に覆われる。この有機絶縁膜３１は各々対応透過導電層２５Ｔを部分的に露出する複数の開口３１Ｈおよびこれら開口３１Ｈをそれぞれ囲むように複数の画素領域ＰＸに対応して配置される凹凸パターンを有する。各薄膜トランジスタ２３は対応走査線１４に接続されるゲート、対応画素電極２５の透過導電層２５Ｔに接続されるソース、および対応信号線１３に接続されるドレインを有する。各画素電極２５の反射導電層２５Ｒは対応透過導電層２５Ｔの外縁にコンタクトして有機絶縁膜３１上に形成される。この反射導電層２５Ｒは有機絶縁膜３１の凹凸パターンに沿って所定の厚さで形成され、ランダムに配置される複数の半球状凸部２５ＲＡおよびこれら半球状凸部２５ＲＡを囲んで配置される凹部２５ＲＢを凹凸パターンとして含む。この反射導電層２５Ｒはこの凹凸パターンにより入射光を散乱させるように反射する。

【００１５】次に、上述した液晶表示装置の製造工程を説明する。

【００１６】アレイ基板ＡＲの製造では、複数の薄膜トランジスタ２３、複数の透過導電層２５Ｔ、その他の配線が通常の成膜およびパターニングを繰り返して高歪点ガラス板や石英板等の光透過性絶縁基板２１上に形成される。続いて、例えばポジ型感光性の樹脂がスピンコート法などにより絶縁基板２１全体を覆う厚さ１μｍ～４μｍ程度の有機絶縁膜３１として塗布される。絶縁基板２１のプリベーク後、有機絶縁膜３１は開口用フォトマスクを用いて複数の開口３１Ｈに対応する範囲で部分的に露光され、さらに信号線１３および走査線１４に重ならないように各画素領域ＰＸの範囲においてランダムなピッチで配置された複数の円形遮光部を持つ凹凸パターン用フォトマスクを用いて露光される。ここでは、凹凸パターン用露光量が１０～２００ｍＪに設定され、開口

用露光量が２００～２０００ｍＪに設定され、円形遮光部の直径が２～２０μｍ程度に設定される。凹凸パターンの起伏形状および密度はフォトマスクの開口形状、密度、露光量等により制御される。

【００１７】続いて、有機絶縁膜３１が上述の露光部分を除去するために現像され、これにより複数の開口３１Ｈと共に有機絶縁膜３１の凹凸パターンを形成する。この段階では凹凸パターンが鋭角状の起伏となるため、絶縁基板２１の熱処理がこの凹凸パターンを角のとれた滑らかな状態にするように行われる。

【００１８】続いて、Ａｌ，Ｎｉ，ＣｒおよびＡｇ等の金属膜がスパッタ法により１００ｎｍ程度の厚さで有機絶縁膜３１上に堆積され、フォトエッチング法で所定の形状にパターニングされ、これにより各々対応透過導電層２５Ｔの外縁にコンタクトした複数の反射導電層２５Ｒを形成する。

【００１９】続いて、複数の柱状スペーサ１５が液晶層ＬＱの厚さとなる所定の間隙を確保するために所定領域に形成され、配向膜２７Ａが低温キュア型のポリイミドを印刷により画素電極２５および有機絶縁膜３１を覆うように３μｍ程度塗布しこれを反射導電層２５Ｒの窓Ｗの長手方向(すなわち、反射導電層２５Ｒと透過導電層２５Ｔとの段差が最も長く伸びる方向)に一致するラビング方向にラビング布でラビング処理することにより形成される。

【００２０】他方、対向基板ＣＴの製造では、顔料などを分散させたカラーフィルタ２４が高歪点ガラス板や石英板等の光透過性絶縁基板２２上に形成される。透明対向電極２９は例えば１ＴＯをスパッタ法で着色層２４上に堆積することにより形成される。続いて、配向膜２７Ｂが低温キュア型のポリイミドを印刷により透明対向電極２９を覆うように３μｍ程度塗布しこれをラビング布でラビング処理することにより形成される。尚、配向膜２７Ｂのラビング処理は液晶層ＬＱの液晶分子を略ホモジニアス配列とするように配向膜２７Ａに対して配向軸を合わせる。アレイ基板ＡＲおよび対向基板ＣＴは配向膜２７Ａおよび２７Ｂの形成後に一体化される。具体的には、アレイ基板ＡＲおよび対向基板ＣＴが配向膜２７Ａおよび２７Ｂを内側にして向かい合わされ、エポキシ系熱硬化樹脂の接着剤である周縁シール材を介して貼り合わされる。液晶層ＬＱはアレイ基板ＡＲおよび対向基板ＣＴ間において周縁シール材で囲まれた液晶注入空間をセルとし、ネマチック液晶のような液晶組成物をこのセルに注入し紫外線硬化樹脂で封止することにより得られる。こうして液晶層ＬＱがアレイ基板ＡＲおよび対向基板ＣＴ間に挟持された状態で、位相差板ＲＴ１および偏光板ＰＬ１が複数の画素電極２５とは反対側において絶縁基板２１に貼り付けられ、位相差板ＲＴ２および偏光板ＰＬ２がカラーフィルタ２４とは反対側において絶縁基板２２に貼り付けられる。液晶表示装置は上述のようにして完成する。

【００２１】上述した第１実施形態の液晶表示装置によれば、反射導電層２５Ｒの窓Ｗは図１に示すように反射導電層２５Ｒおよび透過導電層２５Ｔ間に有機絶縁膜３１の厚さにより生じた段差を補償するよう配向膜２７Ａのラビング方向に略一致する長手方向を持つ長方形である。窓Ｗの長手方向および配向膜２７Ａのラビング方向を例えば１２時間時計形式で表すとすれば、窓Ｗの長手方向が信号線１３に平行な６時－１２時の方向に設定される場合に、配向膜２７Ａのラビング方向も６時－１２時の方向に設定される。このような液晶表示装置を実際に駆動したところ、幅約４μｍの配向不良領域が図３の（ａ）に示すように窓Ｗの一短辺に沿って発生することが顕微鏡観察により確認された。しかし、目視観察では、透過光表示画像および反射光表示画像のいずれも高品位であった。特に透過光表示の場合には、３５０というコントラストを得ることができた。

【００２２】第１比較例として、配向膜２７Ａのラビング方向を７時半－１時半の方向と９時－３時の方向とに変更することを除いて第１実施形態と同様な液晶表示装置を製造し、これを実際に駆動する実験を行った。すると、ラビング方向が７時半－１時半の方向である場合、配向不良領域が図３の（ｂ）に示すように窓Ｗの一長辺および一短辺の両方に沿って発生することが顕微鏡観察により確認された。このときコントラストを測定すると、その結果は２８０であった。他方、ラビング方向が９時－３時の方向である場合、配向不良領域が図３の（ｃ）に示すように窓Ｗの一長辺に沿って発生することが顕微鏡観察により確認された。このときコントラストを測定すると、その結果は２６０であった。すなわち、配向膜２７Ａのラビング方向が窓Ｗの長手方向から大きくずれると、ラビング布が段差の影響で十分ラビングされない配向不良領域の長さを増大させてしまう。従って、この配向不良領域に対応した光漏れにより３００を越えるような高いコントラストを得ることができない。

【００２３】第２比較例として、対向基板ＣＴ側の配向膜２７Ｂをラビング処理しない垂直配向膜に変更しハイブリッド型液晶配列を得るようにしたことを除いて第１実施形態と同様な液晶表示装置を製造し、これを実際に駆動する実験を行った。すると、配向膜２７Ａのラビング方向も６時－１２時の方向に設定される場合において最も高いコントラストが得られるという上述の結果と同様の傾向となった。尚、この比較例ではハイブリッド型液晶配列としたが、ＴＮ型液晶配列としてもよい。

【００２４】次に、本発明の第２実施形態に係る液晶表示装置を説明する。図４はこの液晶表示装置の部分的な断面構造を示し、図５は図４に示す画素付近の平面構造を示す。この液晶表示装置は以下のことを除いて第１実施形態と同様に構成される。このため、図４および図５において第１実施形態と同様な部分を同一参照符号で示

し、その説明を省略する。

【００２５】この液晶表示装置は図１に示すような透過導電膜２５Ｔを持たない。その代わり、光透過部が光反射部の窓Ｗとして反射導電層２５Ｒに形成される３個の切欠部２５ＴＣにより構成される。この切欠部２５ＴＣに対応する領域の液晶は反射導電層２５Ｒのエッジで生じる漏れ電界を利用して駆動される。このため、有機絶縁膜３１の各開口３１Ｈは透過導電膜２５Ｔを露出するためではなく、対応反射導電層２５Ｒを対応薄膜トランジスタ２３のソースに接続するためのコンタクトホールとして形成される。各切欠部２５ＴＣは幅４μｍ×長さ５０μｍという寸法の長方形である。この長方形の長手方向は図５に示すように配向膜２７Ａのラビング方向に略一致する。次に、第１実施形態と異なるアレイ基板ＡＲの製造工程を説明する。アレイ基板ＡＲの製造では、複数の薄膜トランジスタ２３およびその他の配線が通常の成膜およびパターニングを繰り返して高歪点ガラス板や石英板等の光透過性絶縁基板２１上に形成される。続いて、例えばポジ型感光性の樹脂がスピンコート法などにより絶縁基板２１全体を覆う厚さ１μｍ～４μｍ程度の有機絶縁膜３１として塗布される。絶縁基板２１のプリベーク後、有機絶縁膜３１は開口用フォトマスクを用いて複数の開口３１Ｈに対応する範囲で部分的に露光され、さらに信号線１３および走査線１４に重ならないように各画素領域ＰＸの範囲においてランダムなピッチで配置された複数の円形遮光部を持つ凹凸パターン用フォトマスクを用いて露光される。ここでは、第１実施形態と同様に、凹凸パターン用露光量が１０～２００ｍＪに設定され、開口用露光量が２００～２０００ｍＪに設定され、円形遮光部の直径が２～２０μｍ程度に設定される。凹凸パターンの起伏形状および密度はフォトマスクの開口形状、密度、露光量等により制御される。

【００２６】続いて、有機絶縁膜３１が上述の露光部分を除去するために現像され、これにより各々対応薄膜トランジスタ２３のソースを露出する複数の開口３１Ｈと共に有機絶縁膜３１の凹凸パターンを形成する。この段階では凹凸パターンが鋭角状の起伏となるため、絶縁基板２１の熱処理がこの凹凸パターンを角のとれた滑らかな状態にするように行われる。

【００２７】続いて、Ａｌ，Ｎｉ，ＣｒおよびＡｇ等の金属膜がスパッタ法により１００ｎｍ程度の厚さで有機絶縁膜３１上に堆積され、フォトエッチング法で各画素領域ＰＸについて図５に示す所定の形状にパターニングされ、これにより各々対応薄膜トランジスタ２３のソースにコンタクトすると共に３個の切欠部２５ＴＣを持つ複数の反射導電層２５Ｒを形成する。

【００２８】続いて、複数の柱状スペーサ１５が液晶層ＬＱの厚さとなる所定の間隙を確保するために所定領域に形成され、配向膜２７Ａが低温キュア型のポリイミドを印刷により画素電極２５および有機絶縁膜３１を覆うように３μｍ程度塗布し、これを図５に示すように反射導電層２５Ｒの窓Ｗの長手方向(すなわち、光反射部と光透過部との段差が最も長く伸びる方向)に一致するラビング方向にラビング布でラビング処理することにより形成される。

【００２９】この後、対向基板ＣＴの製造工程、並びにアレイ基板ＡＲと対向基板ＣＴとの一体化工程が第１実施形態と同様に行われる。

【００３０】上述した第２実施形態の液晶表示装置によれば、反射導電層２５Ｒの切欠部２５ＴＣが光反射部の窓Ｗとして形成され、この窓Ｗが光反射部および光透過部間に反射導電層２５Ｒの厚さにより生じた段差を補償するよう配向膜２７Ａのラビング方向に略一致する長手方向を持つ長方形である。すなわち、窓Ｗの長手方向が７時半－１時半の方向に設定される場合に、配向膜２７Ａのラビング方向も７時半－１時半の方向に設定される。この場合、窓Ｗの長手方向が配向膜２７Ａのラビング方向から大きくずれている場合よりもラビング布が段差の影響で十分ラビングできない配向膜２７Ａの領域を削減できる。従って、光漏れの原因となる配向不良を低減して、高いコントラストを得ることができる。このような液晶表示装置を実際に駆動したところ、目視観察で高品位な表示画像が確認された。また、透過光表示で２０というコントラストを得ることができた。特に、複数の切欠部２５ＴＣが１０μｍ以下の幅で形成されるような場合には、配向不良による光漏れで低下するコントラストを大幅に改善することが可能である。

【００３１】第３比較例として、配向膜２７Ａのラビング方向を６時－１２時の方向と９時－３時の方向とに変更することを除いて第２実施形態と同様な液晶表示装置を製造し、これを実際に駆動する実験を行った。すると、ラビング方向が６時－１２時の方向である場合、コントラストが透過光表示で８となる。他方、ラビング方向が９時－３時の方向である場合、コントラストが透過光表示で６になる。従って、この配向不良領域に対応した光漏れにより第２実施形態で得られた２０を越えるような透過光表示のコントラストを得ることができない。

【００３２】尚、本発明は上述の実施形態に限定されず、その要旨を逸脱しない範囲で様々に変形可能である。例えば、第２実施形態の切欠部２５ＴＣは長方形でなく、例えば楕円形のように長手方向をもつ他の形状であってもよい。さらに、切欠部２５ＴＣの数を３個以外の数に変更してもよい。

【００３３】

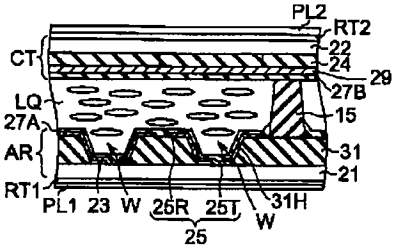
【発明の効果】以上のように本発明によれば、光漏れの原因となる液晶分子の配向不良を低減できる液晶表示装置およびその製造方法を提供できる。

【図面の簡単な説明】

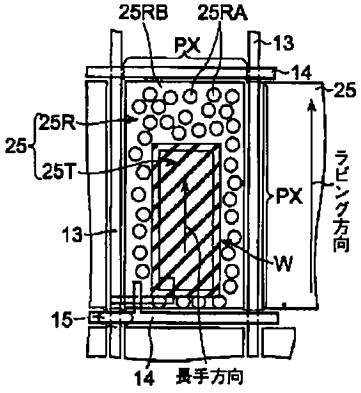
【図１】本発明の第１実施形態に係る液晶表示装置の部分的な断面構造を示す図である。

【図２】図１に示す画素付近の平面構造を示す図である。
【図３】図１に示す窓の長手方向を配向膜のラビング方向に一致させる理由を説明するための図である。
【図４】本発明の第２実施形態に係る液晶表示装置の部分的な断面構造を示す図である。
【図５】図４に示す画素付近の平面構造を示す図である。
【符号の説明】
２５…画素電極
２５Ｔ…透過導電層
２５Ｒ…反射導電層
２５ＴＣ…切欠部
２７Ａ…配向膜
ＡＲ…アレイ基板
ＣＴ…対向基板
ＬＱ…液晶層
ＰＸ…画素領域
Ｗ…窓

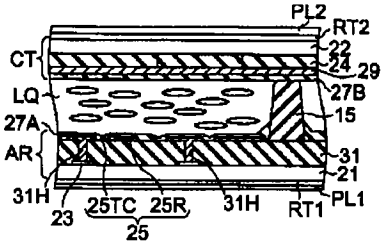
【図１】



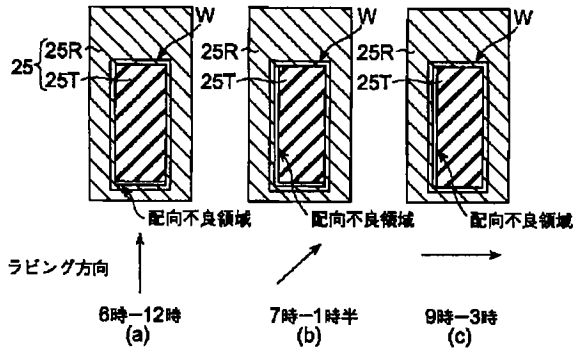
【図２】



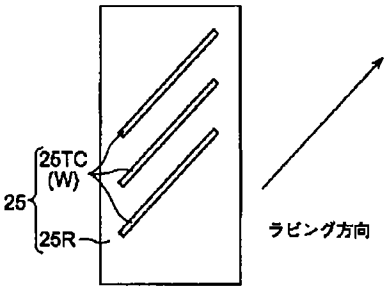
【図４】



【図３】



【図５】



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Ｆターム(参考)　2H090 HB08Y KA05 LA06 LA09 LA15 MB01 MB03
2H091 FA02Y FA08X FA08Z FA11X FA11Z FA14Z FC26 FD06 GA13 HA07 LA17
2H092 JA24 JA41 MA13 NA25 PA02 PA08 PA10 PA11